

interviews. This situation is not very different from a representation by linear regression models which have shown to have considerable predictive power. However, the linear regression formula does not make a lot of sense to the human expert. Therefore, we have proposed elsewhere not only to use an ACLS type of learning system but also to use a learning system that is supposed to create a psychologically valid representation of the human expert's knowledge.

The prototype learner. The "prototype" model has been developed by Rosch. In contrast with linear regression models, the "prototype" model allows for nonmonotonic relations between the values of the attributes and the class determination. So, apart from an implementation of a decision-tree building system à la ACLS, a system has been implemented that is capable of learning categories as proposed in the Rosch model. During the learn phase a training set of old cases, consisting of the values of the attributes and the resulting classification, are offered to the system. The system learns which attributes contribute to which degree to the final classification decision. After the learning phase new cases can be offered to the system which will calculate an overlap score of the new instance with the "prototype" of a class.

Concluding remarks. Current work by the present author using a similar knowledge-elicitation approach in the domain of psychodiagnostics is promising. It appears that "intuitive" knowledge can be elicited with the proposed approach and implemented as a moderator of a primarily pattern-matching-based classification.

## NEW INTERPRETATIONS OF ESP LITERATURE\*

### A CRITICAL REVIEW OF THE DISPLACEMENT EFFECT

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The "displacement effect" in ESP research refers to a situation in which the percipient, instead of describing the intended target for a particular trial, describes some other experimental material. Despite the fact that over 100 papers have dealt with some aspect of the displacement effect since the effect caught the general interest of parapsychologists in 1940, no exhaustive review of the displacement literature has appeared. It was felt that such a review would be timely for a number of reasons, partly because the attitude of researchers these days to the apparent occurrence of displacement is generally one of irritation, whereas earlier researchers reacted with a more positive (and hence possibly more productive) interest; partly because recently some researchers have suggested that in the context of finding limits for psi, the circumstances under which displacement occurs and the extent to which displacement is a "deliberate" error or a genuine error on the part of the percipient may have some theoretical importance. Another reason for a review would be to examine the characteristics of displacement as a phenomenon of interest in itself.

In the past, researchers have explored two main lines of research with respect to displacement; the first has involved the possibility of a relationship between scoring on targets of different displacements, and the second, the possibility of a relationship between displaced scoring and psychological and situational variables.

Concerning the possibility of a relationship between scoring on targets of different displacements, there are a couple of potentially important statistical artifacts that apply to forced-choice studies which can give rise to the appearance of displacement

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when no displacement has taken place. Firstly, extrachance scoring on the intended (0) target, combined with a tendency on the part of the percipient to call more or fewer doubles than chance, automatically gives the appearance of extrachance scoring on adjacent (+1) and (-1) targets. Secondly, the possibility that a percipient may be aware (by means of ESP) of the success or failure of his or her call, and that this knowledge may affect the frequency of local call repeats, gives rise to a possible artifact of (-1) (or [-2], [-3], etc.) extrachance scoring without extrachance scoring on the (0) target itself. Given that these two artifacts could combine to produce a wide variety of scoring patterns across the displaced and intended targets, it is rarely possible to look simply at the scoring rates in a study and know whether any apparent displacement is real or artifactual. Unfortunately, the vast majority of researchers seem to have been unaware of these artifacts, and so only those papers that included a careful analysis to rule out these artifacts were included in the section of the review that dealt with this aspect of displacement.

Concerning the question of the possible relationship between displacement and psychological and situational variables, the review made use of the implicit model of displacement that seems to be taken for granted in the literature but never clearly outlined nor taken to its logical conclusion. This model has displacement essentially as evidence of ESP meant for the target but that was for some reason misdirected. The implications of this model, as the author has interpreted it, are that certain variables (usually assumed to be affectively negative) cause displacement, but that once displaced, scoring relates to the remaining noncausal variables in the same way as nondisplaced scoring would have done. For example, frustration might cause displacement (and thus generally be associated with high displacement scores), while anxiety would be associated with low displacement scores and freedom from anxiety with high displacement scores (assuming that anxiety would normally relate to target scoring in this way). Paradoxically, therefore, affectively negative values would be associated with both high and low displacement scoring, according to whether they were causative or not. This being the case, the author felt it appropriate to review this area by taking in isolation each psychological or situational variable that had been examined with respect to displacement and to look for consistency in the relationship of displacement to these variables. In this section of the review, all those papers that had examined the relationship between displaced scoring and some such variable were reviewed, regardless of whether the authors had ruled out artifactual explanations for the displacement in their studies, since it was felt that the best use of this section was probably as a pointer to good starting points for future research rather than as a definitive indicator of variables that truly relate to displacement.

The great majority of the literature reviewed dealt with forced-choice studies; only two free-response studies passed the

criteria for inclusion in the study (i.e., that the author had carried out a statistical test for displacement or had tried to relate its occurrence to some other variable). Material published between 1938 and 1985 was included from JSPR, PSPR, JASPR, JP, EJP, and other journals, if important.

Although the results of over 60 studies were included in the review, the most striking finding was the lack of consistency of relationship between apparently displaced scoring and any other variable, to the extent that the question naturally arises as to whether displacement is a real effect or not. In addition to the lack of consistency already noted, a number of problems made this area of research virtually impossible to evaluate in this regard. First was the very widespread problem of potential statistical artifacts mentioned earlier; in the author's opinion, it would be possible to account in these terms for the displacement in most studies reported. Second was the problem of post-hoc analysis; many of the papers reviewed came from an era of research in which journals were much less strict than they are nowadays in insisting that authors make a clear distinction between planned and post-hoc testing. Since displacement seems to have been a side issue for most researchers, the extent to which displacement analyses were carried out after someone had glanced through the data may be considerable. Problems of multiple analysis are also present in many papers. Finally, a lack of consistency in the choice of variables examined in relationship to displacement also makes it difficult for a strong case for the effect to emerge.

Because of these problems in evaluating the body of literature on displacement, it is the author's opinion that no strong evidence for the displacement effect exists; this could be either because the effect does not exist or because the evaluative problems outlined above have stood in the way of discovering it. In the latter case, it is suggested that a more productive rationale for future research would involve analysis for statistical artifacts; a clear distinction between post-hoc and planned analyses; correction for multiple analysis; and the consistent study of a few well-chosen variables with respect to displacement, coupled with an awareness of the kind of statistical analyses that would be appropriate according to whether the variable might be causative or correlative.

Few, if any, key parapsychological concepts stand or fall depending on whether displacement exists or not. If it does exist, it is hoped that research along the lines suggested will reveal interesting information about displacement, along with possible methods of preventing its occurrence in studies where it would be unwelcome; if it doesn't exist, then the sooner we turn our attention and limited resources to another area, the better.